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## OBSERVATIONS ON THE BULL-DOG ANT, *MYRMECIA VINDEX*

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The ponerine genus *Myrmecia* Fabricius consists of over seventy species, all of which but one are confined to Australia. The exception is *M. apicalis* Emery which has been reported from New Caledonia. The larger species, like the one which is the subject of this article, are generally known as bull-dog ants, and locally, in Western Australia, as sergeant ants.

*Myrmecia vindex* Fr. Smith is a large species. In the nests we have studied the workers ranged in size from 1.35 cm. to 2.65 cm. It is widely distributed in the South-West from Perth to Albany. In the vicinity of Perth it is common in clay and heavy loam soils, and, in our experience, always associated with *Eucalyptus* trees. In agricultural areas it is confined to the uncleared roadside verges and occasional belts of trees.

The nest site varies. The entrance may be against large stones, against termite mounds, or against trees, in which case the galleries may entwine among the roots making excavation of the nest, for study purposes, difficult. The mound varies in size from being barely discernible to one of 15 inches high. There is little or no uniformity of mound shape. The size of the opening is distinctive. It is quite large and when there are several openings one is usually at least an inch in diameter.

When a small, poorly populated nest is disturbed the larger workers will not usually respond aggressively but rather retreat within the nest. However if a large well populated nest is disturbed, or even approached, the large workers come streaming out of the mound. This reaction is tempered by the prevailing temperature, the ants' alertness decreasing with falling temperatures. When the workers attack they grip their victims with their large jaws, double up their abdomens and insert a sting whose poison produces an irritation equal to or even exceeding that of a bee sting. Mild allergic reactions to the poison have been noted in some people, and a severe condition in a ten-year-old girl resulted from the sting of a related ant, *Myrmecia chasei* (Forel).

### THE STUDY NEST

The following report concerns one particular nest studied in detail by us at a site eleven miles east of Perth, with supplementary observations at another nest at Bullsbrook.

The study nest was situated on a grassed clay ridge about 40 yards from the Helena River flats in Bellevue. The surrounding area is cleared for stock-holding paddocks but many marri (*Eucalyptus calophylla*) have been left as shade trees in the paddocks and along the river bank there are flood gums (*Eucalyptus rudis*). Numerous nests of *M. vindex* occur beneath both species of tree.

We excavated the nest on March 10, 1963. The air temperature at the nest at the time of arrival (7.30 a.m.) was 58° F. (14° C.), and there

was little ant activity at the time. The mound was four inches high and was built against a mound of the termite *Coptotermes acinaciformis* (Froggatt). There were numerous other nests of *M. vindex* in the vicinity. Within two feet of the nest was a large trail of the meat ant, *Iridomyrmex purpureus* (Fr. Smith), which connected two large nests, one 18 feet away and the other 60 feet. At the side of the *M. vindex* mound were the remains of insect prey and numerous discarded pupal cases most of which bore the signs of having been torn open when the emerging ants were helped out by the workers. However some pupal cases had a neat circular hole showing they had been occupied by a parasitic eucharid wasp.

The only activity observed on the surface was among four workers which, three feet from the nest, were dragging a male towards the entrance. In doing so the wings of the male were torn. We subsequently found in the nest seven other males with torn wings. On other occasions we have observed virgin winged females emerging from the entrance of the crater and return to the nest. Never have we seen such a female being worried by the workers.

### EXCAVATION

The termite mound was first lifted off and the ant nest excavated, gallery by gallery. The occupants were collected and placed in 75% alcohol with 2% glycerine. Initially the cool conditions rendered the ants comparatively inactive and in consequence the collecting was simple.

The nest queen was located in a side cell ten inches below the surface. In the same gallery were eleven males, two larger workers and six small workers. It was observed that the majority of the males congregated in cells at the upper one-third of the nest while the females were found at all levels. The smaller workers were mostly at the lower levels, and always with larvae and pupae, which in this nest began to appear 18 inches below the surface.



Fig. 1.—A. M. Douglas collecting ants from an opened nest.

Pupal cases of *M. vindex* are biscuit-coloured, cigar-shaped, and have rounded ends. One end is less rounded than the other and is darker in colour due to the meconium, or larval faecal material. The cases vary in size depending on the size of the occupant. Those measured varied from 1.85 cm. x 0.60 cm. to 2.45 cm. x 0.75 cm.

The eggs of *M. vindex* are quite large and are easily detected, but none were found in this particular nest.

In the lowest chamber were two small cockroaches and a small spider. Throughout the nest an occasional cell containing termites was found. These cells appeared to be self-contained but careful examination revealed thin flimsy galleries connecting them with the main termite nest.

When nests of *Myrmecia* are opened a characteristic smell is immediately apparent. Perhaps it is this which attracts other ants, for, in a surprisingly short time, the nest is invaded by different ant species from surrounding nests, in particular *Iridomyrmex purpureus*. These swarm over the gigantic *Myrmecia* which seldom defend themselves. Their appendages are bitten off and their bodies dragged away.

Whilst we were examining this particular nest the day became hotter and the ant's activity increased. Before long we, as well as the remaining *Myrmecia vindex*, were being attacked by hundreds of *Iridomyrmex purpureus*, together with a small species of *Iridomyrmex* as well as several *Rhytidoponera* species. The attacking ants also set upon *Myrmecia* larvae and pupal cases. In fact they were quite useful in locating small larvae that we had missed. The *Myrmecia* did not retaliate against the invading ants but persistently continued to attack our hands and other parts of our bodies. It is significant to note that the *Iridomyrmex purpureus*, although their trail passed close by other *M. vindex* mounds, only attacked the breached nest. Eventually they began a trail to it from their own mound.

When the nest was completely excavated, it was found to have spread over an area 20 inches by 18 inches and to a depth of 28 inches.

## POPULATION OF STUDY NEST

The population of the study nest is summarised in Table 1.

TABLE 1.—CONTENTS OF NEST

<b>Adult Ants.</b>	
Nest Queen	1
Female virgins, winged	38
Female virgins, de-alated	2
Males, winged	224
Workers	210
<b>Contents of pupal cases.</b>	
(a) Living cases	
Worker nymphs, white	76
Worker nymphs, pigmented	47
Male nymphs, white	27
Male nymphs, pigmented	43
(b) Parasitised cases.	
Eucharids, developed	13
Eucharids, nymphs	8
<b>Larvae</b>	<b>22</b>

The workers are highly variable in size. At first it would appear they comprise a graded series but a closer examination of the measurements indicates that two overlapping size groups are present. This is evident in Fig. 2, a histogram of the body lengths of the worker ants we measured.

Our data were analyzed by Mr. J. Prestage, lecturer in mathematics at the Graylands Teachers' College, who found that there was a bimodal distribution with means of 1.7 cm. and 2.19 cm. There was a significant difference between these means at the 1% level of confidence.



To confirm the existence of these two size groups, we felt that a greater precision of length measurement was desirable. Accordingly we obtained a fresh sample by collecting all the workers from another nest of *M. vindex* at Bullsbrook on April 14, 1968. From the measurements of this population a scatter diagram was compiled using two variables, body length and the distance between the outer extremities of the eyes (Fig. 3). This substantiates the existence of two size groups of workers since it also showed a bimodal distribution with means of 1.73 cm. body length, 0.28 cm. eye width and 2.48 cm. body length, 0.36 cm. eye width.

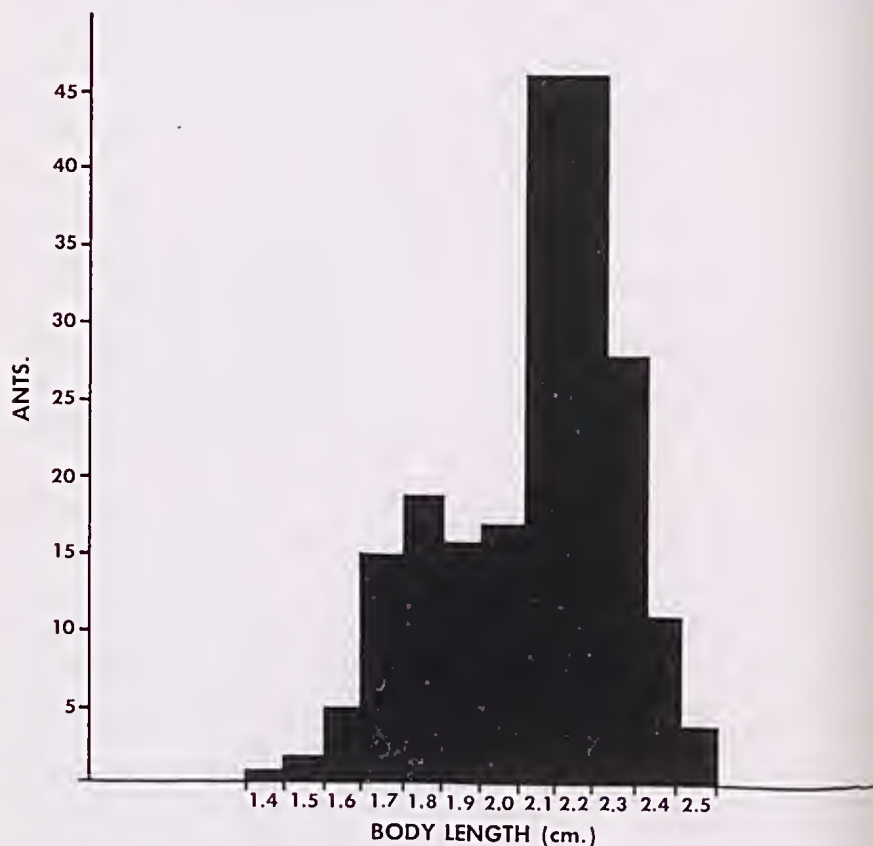


Fig. 2—Histogram of body lengths of worker ants

#### PREY OF *M. VINDEX*

The adult *M. vindex* are sap and nectar feeders but the larvae feed on the bodies of insects captured by the workers. Indeed so voracious are the young that we have observed, in artificial nests, one larva feeding on another that had been placed too close to it.

During the progress of our nest excavation *Myrmecia* workers were returning from foraging. Eleven of these were counted. Two of them had fresh gasters of the honey bee and one the head capsule of a small grasshopper. Remnants of other insects found in the nest and in a refuse dump at the side of the mound are listed in the following tabulation.

COLEOPTERA

Scarabaeidae

*Anoplostethus opalinus* Brulle (thorax and elytra)

DIPTERA

Numerous species (wings)

HEMIPTERA

Cicadidae (wings, head capsules and thorax)

HYMENOPTERA

Megachilidae (abdomen)

Apidae

*Apis mellifera* (Linnaeus) (wings, head, thorax, abdomen)

NEUROPTERA (wings)

ODONATA (wings and head capsules)

ORTHOPTERA

Gryllidae

*Teleogryllus commodus* (Walker) (head capsule, thorax)

Gryllotalpidae (fore-leg)

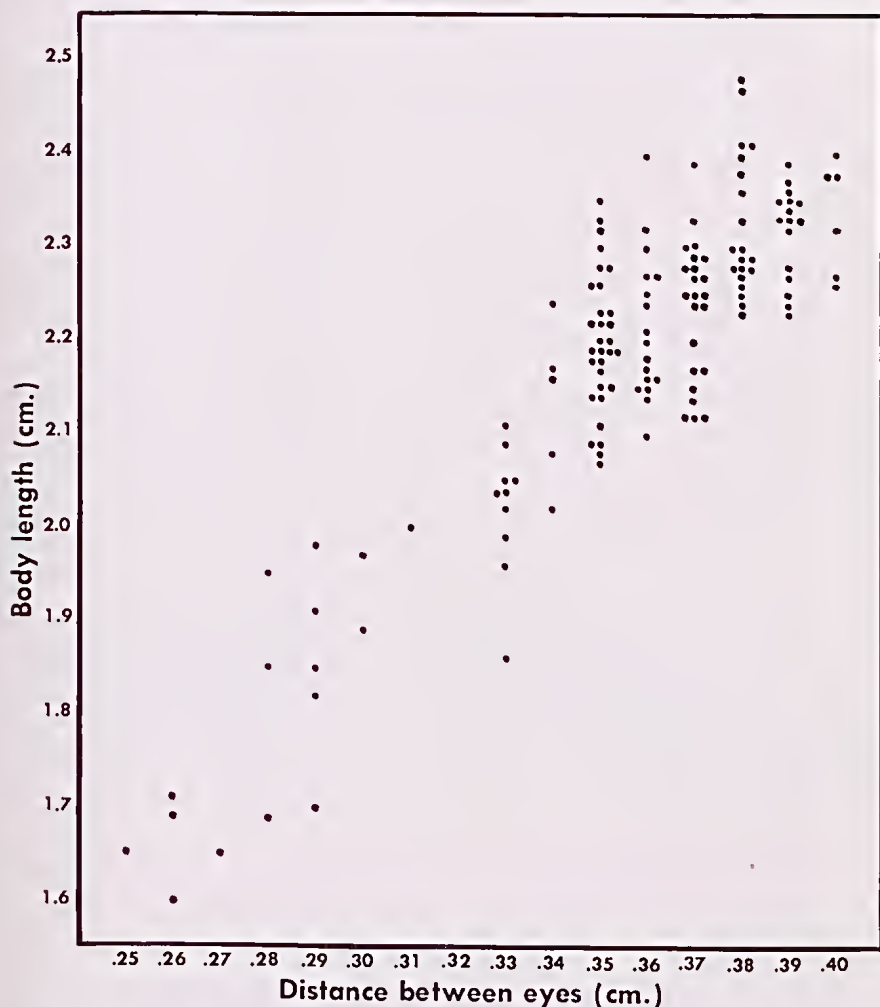


Fig. 3.—Scatter diagram of measurements of workers from Bullsbrook nest.